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(71) Applicant: **ROLM SYSTEMS**
**4900 Old Ironside Drive, P.O.Box 58075**
**Santa Clara, CA 95052(US)**

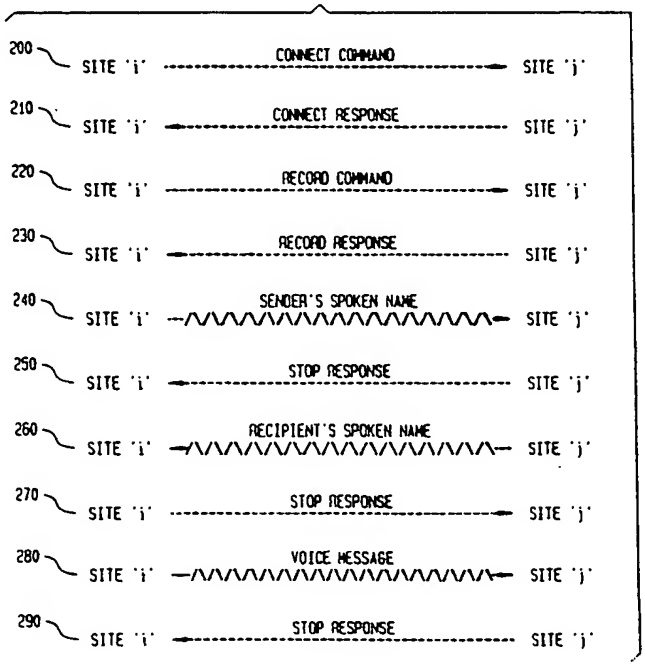
(72) Inventor: **Perelman, Roberto**
**1614 Eagle Drive**
**Sunnyvale, CA 94087(US)**

(74) Representative: **Fuchs, Franz-Josef, Dr.-Ing. et al**
**Postfach 22 13 17**
**W-8000 München 22(DE)**

## (54) Protocol for transmitting messages in a network.

(57) Method and apparatus for transmitting audio messages, user names --alphabetic and/or spoken, and network addresses among sites of a network of store-and-forward messaging system sites using telephone lines.

*FIG. 2*

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## Technical field of the Invention

The present invention pertains to method and apparatus for delivering messages among sites of a network of store-and-forward messaging system sites using telephone lines.

## Background of the Invention

There is a need in the art for method and apparatus for transmitting audio (voice, fax etc), messages, user names --alphabetic and/or spoken, and network addresses among sites of a network of store-and-forward messaging sites using telephone lines.

## Summary of the Invention

Embodiments of the present invention advantageously satisfy the above-identified need in the art and provide method and apparatus for transmitting voice messages, user names --alphabetic and/or spoken, and network addresses among sites of a network of store-and-forward messaging system sites using telephone lines.

## Brief Description of the Drawing

A complete understanding of the present invention may be gained by considering the following detailed description in conjunction with the accompanying drawing, in which:

FIG. 1 is an block diagram of a network of store-and-forward messaging system sites; and

FIG. 2 shows control commands and responses exchanged in accordance with the present invention by two communicating voice store-and-forward messaging sites of the network shown in FIG. 1.

## Detailed Description

FIG. 1 shows network 90 which utilizes an embodiment of the present invention. For ease of understanding, we will first describe some basic transactions which are carried out in network 90 before we describe a preferred embodiment of the present invention in detail with reference to FIG. 2.

Network 90 is comprised of audio (voice) store-and-forward messaging system sites $10_1$ to $10_n$. Each of store-and-forward messaging system sites $10_1$ to $10_n$ interacts with local users and is comprised of a local database $20_1$ to $20_n$, respectively. Further, as is shown in FIG. 1, each of store-and-forward messaging system sites $10_1$ to $10_n$ has a communications connection with predetermined ones of the other store-and-forward messaging system sites in network 90. Of course, those of ordinary skill in the art clearly appreciate that network 90 may also be embodied in a manner wherein private branch exchanges are utilized so that any site may contact any other site via, for example, the public telephone network. Embodiments of the present invention provide the mechanism whereby the transactions described below occur.

In one type of message transfer transaction which is carried out over network 90, whenever a message sender at a first store-and-forward messaging system site addresses a message recipient at a second store-and-forward messaging system site by name and the message recipient's name is not stored in the message sender's local database, the message sender's local store-and-forward messaging system site requires the message sender to address the message recipient by numeric address. Then, the message sender's local store-and-forward messaging system site transmits the message, for example, a voice message, to the local store-and-forward message system site of the message recipient along with the message sender's alphabetic name and a flag which indicates that the message recipient's name is unknown to the sending system site. In response, the receiving system site sends a communication to the sending system site to: (a) request a spoken record of the message sender's name if the message recipient's system site does not have the message sender's name in its local database and (b) transmit the message recipient's alphabetic and spoken name. Finally, both the sender's and recipient's system sites, as necessary, update their local databases with the sender's and the recipient's alphabetic and spoken names, respectively. As a result of this, as one can readily appreciate, both the sender's and recipient's system sites now know the sender's and recipient's names and name entry and name confirmation can be used the next time a message is addressed to the same recipient and name entry and name confirmation for the message sender can also be used by users of the original message recipient's system site.

In another type of transaction where the message sender's system site has the alphabetic name of the message recipient in its local database, the message sender may address a message recipient by either name or telephone number. Then, when the message sender's local store-and-forward message system transmits a message to the local store-and-forward message system site of the message recipient, both the message recipient's alphabetic name and telephone number are transmitted to the message recipient's system site. In response, the message recipient's system site verifies the message recipient's alphabetic name and telephone number and the message may not be accepted unless both match. This provides a mea-

sure of security in case the recipient is a person with the same name as a user who has previously left the system.

We now turn to describe the manner in which an embodiment of the present invention operates in detail with reference to FIG. 2 to enable the above-described transactions to occur. FIG. 2 shows the control commands and responses exchanged by two communicating audio (voice) store-and-forward messaging system sites during a typical session. A session is established when site "i" makes a telephone call to a reserved access number at site "j". The answering site, site "j", knows that this telephone call is a network call which is being made by another voice store-and-forward messaging site, site "i", as opposed to, for example, a telephone call which is being made by a user, because the call is being made to a reserved access telephone number. The telephone call may go over public switched telephone lines or over private lines.

We will now describe the communication between site "i" and site "j" in general terms. First, the communicating sites perform a line test to ensure that the quality of the line is adequate for the session. If the line passes the test, then the two sites connect modems to the line. Although a line test is not essential, it is highly recommended, to ensure that voice signals which are delivered across the network remain of high quality. Those of ordinary skill in the art understand that there are many methods which are well known to those of ordinary skill in the art for performing a line test. Second, using the modems, the sites exchange control commands and responses in a manner which will be described in detail below in connection with FIG. 2. Third, at predetermined times during a session, the sites "turn-off" the modems and the communicating sites exchange voice signals over the line. The voice signals may relate to a voice message being delivered from one user to another or they may relate to a spoken name. After the voice signals are transmitted, the sites "turn-on" the modems to permit the sites to exchange verification of delivery notifications and to move on to the next user message or name. Fourth, a session ends when either site, generally the sending site hangs up by, for example, going on-hook. The other site will disconnect because it will detect the remote modem dropping --for example, it detects a carrier fault-- or because the telephone network signals the far end disconnect, whichever occurs first.

The protocol used for communication between sites is comprised of four (4) layers. The first or bottom layer, i.e., the physical layer is where mechanical, electrical, functional, and procedural characteristics are defined to access a physical medium, for example, a telephone line. The next or second layer, i.e., the data link layer, provides for reliable transfer of information across the physical layer by sending blocks of data, referred to as frames, along with synchronization, error control, and flow control. In addition, the second layer also supervises transitions from: (a) line test stage to modem; (b) from modem to voice; and (c) voice to modem. The first two layers are well known to those of ordinary skill in the art.

We next describe the third layer, i.e., the session layer, and the fourth layer, i.e., the application layer. FIG. 2 shows the control commands and responses which reside at the session and application layers.

The session layer provides a structure for communication between applications and, as such, it establishes, manages, and terminates connections, i.e., sessions, between message delivery applications. The application layer carries out exchanges of user messages and names using services provided by the bottom layers.

In particular, as shown in FIG. 2 at line 200, to initiate a session layer, sending site "i" generates a "Connect command" whenever the bottom layers notify it that the link is ready, i.e., receiving site "j" has answered, the line test has been performed and passed, and the modem is on line. A "Connect command" comprises the following information: (a) protocol version number used by sending site "i" so that sites which utilize older versions of the protocol can communicate --for example, if the protocol version numbers of sending site "i" and receiving site "j" are different, the older protocol is used; (b) channel number, i.e., port, being used by sending site "i" for this session --this is needed to route received application layer commands and responses to the proper process, i.e., the software task that is handling this particular session; (c) flag to indicate whether sending site "i" will permit receiving site "j" to turn the connection around after sending site "i" has finished sending all its voice messages, so that receiving site "j" can "piggyback," i.e., send, its own messages during the same call --the "piggyback" feature is decided solely by sending site "i"; (d) flag which indicates whether sending site "i" will exchange names with receiving site "j" --if one site is willing to exchange, but not the other, the latter wins; (e) identification of sending site "i"; and (f) identification of sending node. The byte format for this command is set forth in detail in the Appendix.

As shown in FIG. 2 at line 210, in response to the "Connect command," receiving site "j" sends a "Connect response" back to site "i". A "Connect response" comprises the following information: (a) protocol version number used by receiving site "j"; (b) channel number being used by receiving site "j" for this session; (c) flag which indicates whether

receiving site "j" will exchange names with sending site "i"; (d) status code which indicates whether receiving site "j" will accept the call or a reason why it cannot; (e) identification of receiving site "j"; and (f) identification of receiving node. The byte format for this command is set forth in detail in the Appendix.

If a session is established successfully in accordance with the above-described "Connect" command" and "Connect response" dialogue, then the connection settles into "steady-state" mode. In this stage, the next set of commands and responses shown in Fig. 2 will repeat once for every subscriber message that needs to be delivered.

As shown in FIG. 2 at line 220, the first command of a repeating set is a "Record command" which is sent from sending site "i" to receiving site "j". The "Record command" comprises the following information: (a) message sender's network address and message recipient's network address; (b) message recipient's name if it is available at sending site "i" --This is sent so that receiving site "j" can verify that both the message recipient's network address and name match a profile of a message recipient. If the message recipient's name or the message recipient's network address or both do not match a profile stored in a local database associated with receiving site "j", receiving site "j" will notify sending site "i" accordingly; (c) message sender's name if the communicating sites negotiated during session establishment that user names would be exchanged; (d) flag to indicate whether spoken names for the message sender and the message recipient are available at sending site "i" --this is only needed if the communicating sites negotiated during session establishment that names would be exchanged; (e) date and time when the message sender recorded the message; (f) size of the recorded message, in seconds; (g) flag to indicate whether this is a regular message which is received by a message receiver in due course, a message which is being forwarded from a first message recipient to another message recipient, a return receipt notification of the receipt of a message, a message that is being returned to the sending site as undeliverable, or a specially marked "name only" message which will be described further below; (h) flag to indicate special delivery options reguested by the message sender such as, for example: (1) whether this message is to be delivered immediately or is to be batched for delivery at system administrator configurable times of the day, (2) whether this is a private message which may not be forwarded by the message recipient to others, and (3) whether the message sender requested a return receipt to be sent when the message recipient listens to the message; (i) identification code which is unique for each message --this is used to detect duplicate delivery of the same message and is needed, for example, in instances where a receiving site delivers a message to a message recipient, but the connection is abnormally dropped before the sending site has been notified of the successful delivery; and (j) identification code which is unique to each recorded voice file stored at the sending site, --this is used in instances where the same recording is used by more than one message such as, for example, when a message sender addresses the same message to multiple message recipients so that the voice portion need only be transmitted once. The byte format for this command is set forth in detail in the Appendix.

As shown in FIG. 2 at line 230, in response to the "Record command," receiving site "j" sends back a "Record response" which comprises the following information: (a) status code, indicating whether receiving site "j" will accept the message or the reason why it cannot. Some possible reasons for not accepting the message are: (i) the message recipient is not valid one, (ii) the message recipient's mailbox is full, and (iii) so forth; (b) a flag indicating whether the message sender's name was added to the database at receiving site "j"; (c) a flag indicating whether receiving site "j" wishes to receive the spoken name of the message sender and whether it intends to send the spoken name of the message recipient; (d) name of the message recipient, if sending site "i" did not include it in the "Record command" because sending site "i" did not have it and the communicating sites negotiated during session establishment that user names would be exchanged. The byte format for this command is set forth in detail in the Appendix.

The next step in the communication depends on the particular "Record command" and "Record response" exchanged in a particular case. For example, line 240 of FIG. 2 shows a portion of a communication wherein the next step comprises sending site "i" transmitting the message sender's spoken name to receiving site "j". This transmittal is accomplished when site "i" and site "j" switch off their modems and, then, sending site "i" transmits the message sender's spoken name while receiving site "j" receives and records it. Once the recording is completed, site "i" and site "j" switch their modems back on so that receiving site "j" may acknowledge successful or non-successful reception. As shown at line 250 of FIG. 2, this is done when receiving site "j" transmits a "Stop response" to sending site "i", which "Stop response" comprises a status code. The byte format for this command is set forth in detail in the Appendix. The reason this is considered a response is because the command to stop recording is implicitly generated by sending site "i" when it stops

playback and switches its modem on, thereby causing receiving site "j" to turn its modem on too. If it is appropriate for the communicating sites to skip transmission of the spoken name for the message sender, they just simply eliminate the two steps above in the sequence.

Site "i" and site "j" may decide, based on the "Record command" and "Record response" sent previously, to transmit the spoken name for the message recipient. To do that, they just repeat the two steps outlined above, reversing roles, as shown by lines 260 and 270 of FIG. 2. If this is not appropriate, these steps are skipped.

Finally, as shown by lines 280 and 290 of FIG. 2, a voice message is transmitted in a manner which is similar to the manner in which the spoken names were transmitted. Note that these steps may also be skipped. This would occur, for example, in cases such as: (a) delivery of a "return receipt" --which "return receipt" has no associated voice message; (b) delivery of a message for which receiving site "j" already has the recording; or (c) duplicate delivery of a previously sent message.

In accordance with the present invention, a variation of the above-described repeating set of commands and responses is used whenever sending site "i" wishes to "export" a selected list of subscriber names, alphabetic and spoken, to receiving site "j". In this event, since the subscriber names being sent are not associated with a voice message being delivered, the "Record command" specifies that this is a "name only" message. Then, only a "Record command", "Record response", optionally the message sender's spoken name, and "Stop response" are exchanged.

After sending site "i" has finished delivering everything it intended to deliver, control of the connection reverts back to the session layer. At this point, sending site "i" has two options. First, it goes on-hook, i.e., "hangs up", to signal the end of the call or, second, it sends a "Piggyback command" having no parameters. The byte format for this command is set forth in detail in the Appendix. If sending site "i" sends a "Piggyback command", then receiving site "j" determines whether it has any messages to deliver to sending site "i". If it does, receiving site "j" responds by transmitting a "Connect command" to initiate a session from the beginning, except with roles reversed and in the opposite direction. Otherwise, receiving site "j" responds to the "Piggyback command" by going on-hook.

In a preferred embodiment of the present invention, a digital signal processor (DSP) is used to provide the above-described functions which relate to a modem. This is advantageous in a messaging system such as the ROLM Systems PhoneMail messaging system because any channel, i.e., port, may be used for network message delivery and dedicated ports are not needed. In fact, the same board used in PhoneMail for voice processing using DSP techniques provides modem emulation and line test functions used at the beginning of a network message delivery session, i.e., the same hardware is used to run the DSP code needed for voice processing, modem emulation, and line testing. This permits one to utilize any port for intersite message delivery. For example, in a preferred embodiment of the present invention, a DSP may perform the following functions: originate modem, answer modem, originate line test, and answer line test. Further, it should be clear to those of ordinary skill in the art as to how these functions may be emulated by a DSP. This may be performed as follows. First, a sending site would command its DSP subsystem to start emulating an originate modem on the channel being used for a particular connection. The recipient site commands its DSP subsystem to emulate an answer modem. For example, both DSP subsystems might emulate a Bell System 103 modem. Once the respective DSP subsystems report "carrier detect," the above-described data exchange takes place. Of course, those of ordinary skill in the art recognize that, just as with a standalone modem, it is possible to get a "carrier fault" at any time during the connection which would cause the connection to be dropped.

As has been described above, transitions occur from "modem" mode to "voice playback/recording" mode and then back to "modem" mode. This occurs as follows. First, receiving site "j" drops its carrier, i.e., stops sending the carrier tone. Second, sending site "i" detects a carrier fault, stops its own modem, and starts playing back a voice message. Third, receiving site "j" starts recording as soon as it detects that the carrier from sending site "i" has dropped. Fourth, as receiving site "j" is recording, it constantly monitors the incoming voice signal to detect the end thereof and the beginning of a modem carrier. Fifth, whenever sending site "i" reaches the end of the voice message, it turns on its answer modem, i.e., it puts carrier on the line. Lastly, receiving site "j" stops recording and starts its own originate modem.

Those skilled in the art recognize that further embodiments of the present invention may be made without departing from its teachings. For example, embodiments of the present invention may be fabricated utilizing a stand-alone, off-the-shelf modem along with hardware needed to switch it in and out of the line, the fabrication of which hardware is well known to those of ordinary skill in the art, so that voice can be sent over the same line. Further, embodiments of the present invention may be fabricated utilizing a stand-alone, off-the-

shelf modem and wherein parallel calls are made from sending site to receiving site. In one such embodiment, one call will carry the voice signals and the other call will carry data transmission, i.e., commands and responses, using the modem. Still further, embodiments of the present invention may be fabricated utilizing DTMF tone generators and detectors for sending commands and responses as an alternative to the use of modems or modem emulators. Yet still further, embodiments of the present invention may be fabricated utilizing an alternative protocol such as, for example, wherein the message sender's spoken name and voice message are sent in one transmission, but separated by a predetermined tone.

## Claims

1. Method for use in a network of sites for use in transmitting messages and audio signals between two sites which are connected by one or more telephone lines, the method comprising the steps of:

   exchanging predetermined control commands and responses using data transmission and reception apparatus at the two sites, a sending site and a receiving site;

   transmitting audio signals between the sending and receiving sites using voice transmission and reception apparatus at the two sites; and

   exchanging predetermined delivery information using the data transmission and reception apparatus at the two sites.

2. The method of claim 1 wherein the step of exchanging predetermined control commands and responses comprises the steps of:

   the sending site transmitting a connect command to the receiving site and, in response;

   the receiving site transmitting a connect response to the sending site.

3. The method of claim 2 wherein the step of exchanging predetermined control commands and responses further comprises:

   the sending site transmitting a record command to the receiving site after the sending site receives the connect response from the receiving site and, in response;

   the receiving site transmitting a record response to the sending site.

4. The method of claim 3 wherein the step of exchanging predetermined delivery information comprises the steps of:

   the receiving site transmitting a stop response to the sending site.

5. The method of claim 3 wherein the step of exchanging predetermined delivery information comprises the steps of:

   the sending site transmitting a stop response to the receiving site.

6. The method of claim 4 wherein the step of exchanging predetermined delivery information further comprises the steps of:

   the receiving site transmitting a piggyback command to the sending site.

FIG. 1

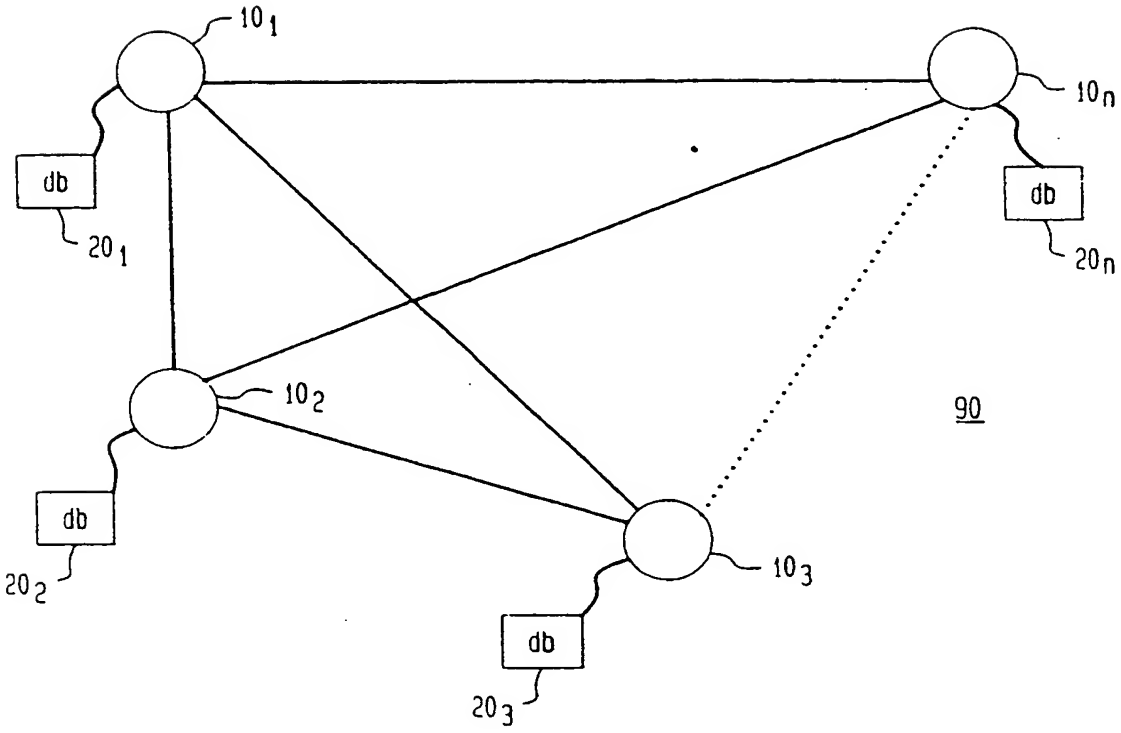
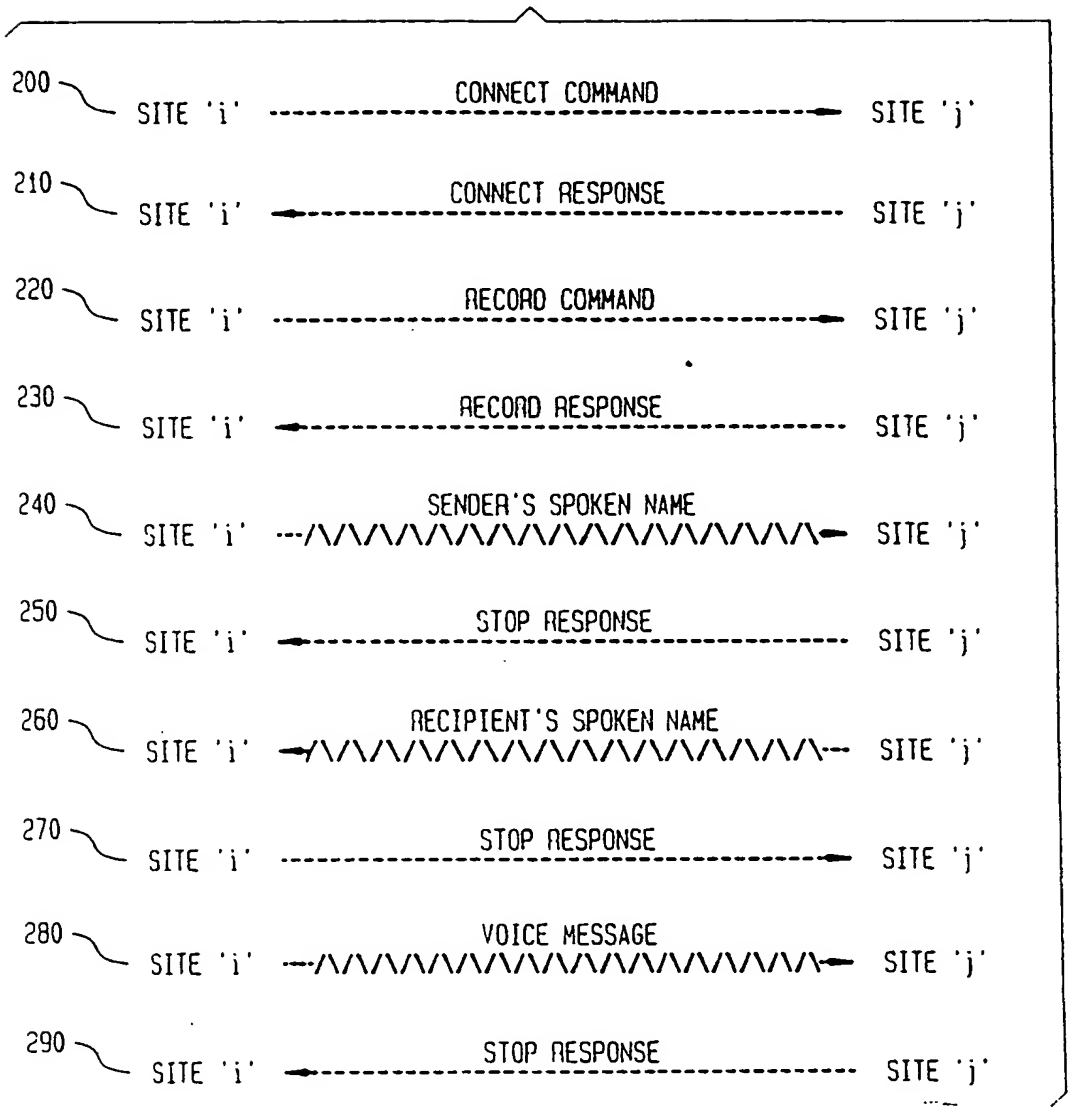


FIG. 2


200
SITE 'i'
CONNECT COMMAND
SITE 'j'
210
SITE 'i'
CONNECT RESPONSE
SITE 'j'
220
SITE 'i'
RECORD COMMAND
SITE 'j'
230
SITE 'i'
RECORD RESPONSE
SITE 'j'
240
SITE 'i'
SENDER'S SPOKEN NAME
SITE 'j'
250
SITE 'i'
STOP RESPONSE
SITE 'j'
260
SITE 'i'
RECIPIENT'S SPOKEN NAME
SITE 'j'
270
SITE 'i'
STOP RESPONSE
SITE 'j'
280
SITE 'i'
VOICE MESSAGE
SITE 'j'
290
SITE 'i'
STOP RESPONSE
SITE 'j'

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(71) Applicant: **ROLM SYSTEMS**
**4900 Old Ironside Drive, P.O.Box 58075**
**Santa Clara, CA 95052(US)**

(72) Inventor: **Perelman, Roberto**
**1614 Eagle Drive**
**Sunnyvale, CA 94087(US)**

(74) Representative: **Fuchs, Franz-Josef, Dr.-Ing. et al**
**Postfach 22 13 17**
**D-80503 München (DE)**

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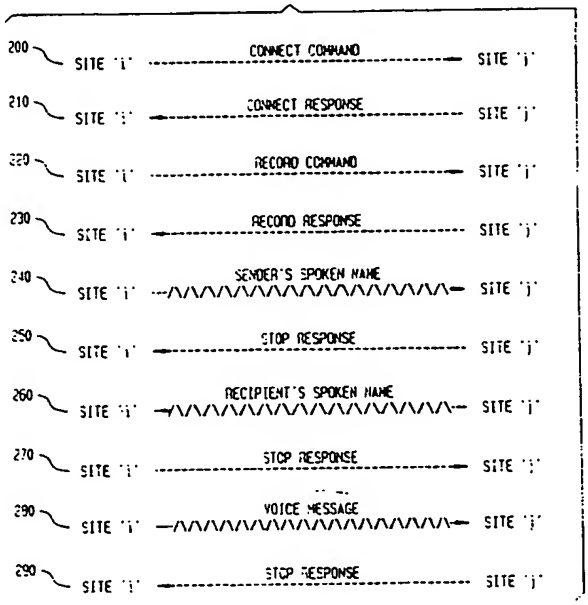


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# EUROPEAN SEARCH REPORT

Application Number
EP 92 10 5367

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| A | WO-A-8 808 654 (A.T.T.)<br>* page 4, line 21 - page 6, line 14 * | 1-6 | H04M3/42<br>H04M7/00<br>H04M3/50 |
| A | US-A-4 933 967 (LO ET AL) | | |
| A | US-A-4 580 016 (WILLIAMSON)<br>* column 3, line 36 - column 4, line 60 * | 1-6 | |
| A | IEEE INTERNATIONAL CONFERENCE ON COMMUNICATIONS SESSION 40.6. DIGITAL TECHNOLOGY... 12 June 1988, PHILADELPHIA(US)<br>pages 1327 - 1331<br>J.SHAH ET AL 'APPLICATION OF A NEW NETWORK CONCEPT FOR FASTER SERVICE DEPLOYMENT'<br>* page 1330, right column, line 19 - page 1331, left column, line 5; figure 5 * | | |

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

H04M
H04Q

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 30 JUNE 1993 | VANDEVENNE M.J. |

CATEGORY OF CITED DOCUMENTS

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